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(12) (19) (CA) **Demande-Application**

(21) (A1) **2,277,540**  
(22) 1999/07/15  
(43) 2001/01/15

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(51) Int.Cl.<sup>6</sup> C02F 1/24

(54) **PROCEDE DE FLOTTATION POUR L'EPURATION DES EAUX  
COURANTES**

(54) **FLOTATIONAL CLEAN-UP OF RUNNING WATER**

(57) A method of running water i.e. rivers, creeks, springs, natural, and industrial, and any other streams clean up from pollutants on the basis of in situ flotational processes is proposed. The proposed method includes flotational clean-up of spills into running water. Polluting agents are removed from the water with froth by froth collectors.



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## ABSTRACT

A method of running water i.e. rivers, creeks, springs, natural, and industrial, and any other streams clean up from pollutants on the basic of *in situ* flotational processes is proposed. The proposed method includes flotational clean-up of spills into running water. Polluting agents are removed from the water with froth by froth collectors.

## FLOTATIONAL CLEAN-UP OF RUNNING WATER

The present invention relates to environment protection by flotational clean up of running water from pollutants. Running water means rivers, creeks, springs, small streams, industrial and waste streams, mining effluents, sewage and any other streams.

In the patent, U.S. Pat. No. 4,244,819, dated Jun., 1981, a floating anti-pollution barrier for combating water pollution is disclosed. The floating pockets of the barrier, the openings of which are downwardly disposed, are given their shape and kept in shape by masses of a material which is lighter than water.

10 In the patent, U.S. Pat. No. 5,122,165, dated Jun., 1992, a process system and apparatus for removal of toxic volatile compounds and surfactants from a contaminated liquid stream is described. This process system involves liquid pumping; gas purification by a foam collector; etc.

Flotational separation techniques, especially the techniques such as those in U.S. Pat. No. 5,306,422 dated Apr., 1994 and U.S. Pat. No. 5,538,631 dated Jul., 1996 allow to treat the waste water.

In the patent U.S. Pat. No. 5,840,156 dated Nov., 1998, a froth flotational process for deinking wastewater using multiflow pressurized deinking module is disclosed.

20 To the best knowledge of Your Petitioners all currently existing methods of water treatment utilize diverting water to some treatment facility and there is no method acting directly at water in rivers, creeks, springs etc. Meantime in nature running water is often mixed with air, froth on the water surface is abundant especially after some obstacles present at stream bed, where turbulence occurs. These elements are also characteristic to flotational process and the basic idea of proposed invention is to utilize naturally occurring flotational process of pollutants or to enhance this flotational process by adding surfactants, providing changes in water speed and character of flow, etc. Froth collection and removed are thus the next step in a clean-up process.

30 For performing flotational processes, this method uses flotational agents that are either already present into the water as a result of industrial or naturally occurring biological activities or flotational agents are added to the water. Air is taken into the water stream and is released forming further air bubbles because of naturally occurring changes in water speed along the water stream. Turbulent character of water stream ensures capturing of polluting agents by air bubbles. To promote air delivery into running water either artificial changes in water speed are arranged or

air is delivered directly by pumping it into the water wherein the air bubbles form air curtain across water current and create turbulence, or air bubbles and turbulence are created indirectly by pumping water saturated with air under high pressure (dissolved air flotation).

40 To collect flotational froth, one, two or any necessary number of froth collectors are installed on the top of the water stream. Froth collectors protrudes from one bank of the stream to the other, thus making it impossible for the froth to by-pass the froth collector. The froth collector may be constructed and placed in a way that allows the froth to be concentrated at the selected points.

The froth further has to be removed from the said froth collector, it could be pumped to froth collecting tanks, ponds or treatment plant.

The flotational clean up of spills into running water where flotational agents are added to contaminated spots of water and flotational traps are installed downstream to intercept the contamination, where flotational trap is the air or water saturated with air delivering pipe installed across the stream, and froth collectors installed further downstream.

## FLOTATIONAL CLEAN-UP OF RUNNING WATER

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of flotational clean up of running water, running water means rivers, creeks, springs, natural, industrial, waste, sewage and any other streams, mining effluents, from pollutants, the said method utilizes flotational agents, air bubbles and froth collectors, the said froth collectors collect froth with polluting agents and the said froth collectors are installed on the top of the water across the water current, the said froth is further removed from froth collectors for disposal or treatment.
2. A method of flotational clean up as it is claimed in Claim 1, which utilizes flotational agents that are already present in the water as a result of industrial or naturally occurring biological activities or of any other reasons, or the said flotational agents are added to the water to promote the flotational processes.
3. A method of flotational clean up as it is claimed in Claim 1, wherein air for the said flotational processes is taken into the water stream and further released forming air bubbles because of naturally occurring reasons, for example, but not limited by this example a waterfall is created.
4. A method of flotational clean up as it is claimed in Claim 1, wherein in order to promote air delivery into running water and create turbulence artificial changes in character of water current are arranged, for example, but not limited by this example rapids are created.
5. A method of flotational clean up as it is claimed in Claim 1, wherein air bubbles are formed as a result of technological activity.
6. A method as it is claimed in Claim 5, wherein air is delivered to water by pipe or pipes laying on the bottom and protruding from one bank of the running water to another bank across the water current, forming an air curtain across water current, the said air curtain means air as released from said pipe or pipes across the whole current and not in one or few points.
7. A method as it is claimed in Claim 6, wherein in order to create the said air curtain water saturated with air under high pressure is released through the said pipe across the whole current (dissolved air flotation) or the said air curtain is formed from air bubbles created by any other methods known in microflotation, for example, but not limited by this example, air bubbles are formed electrostatically.

8. A method of flotational clean up as it is claimed in Claim 1, wherein one, two or any necessary number of froth collectors are installed on the top of the water stream for example, but not limited by this example the said froth collectors float across the water stream.
9. A froth collector, as it is claimed in Claim 8, wherein the said froth collectors protrudes from one bank of the stream to the other of the said stream, thus making it impossible for the froth to by-pass the said froth collector.
10. A froth collector as it is claimed in Claim 8 and Claim 9, wherein the said froth collector is constructed and placed in a way that allows the froth to be concentrated at the selected points of the said froth collector, where at the said points froth traps could be located, for example, but not limited by this example the said froth collector is placed on the surface of water stream forming an angle of less than  $90^{\circ}$  with the said water stream direction, thus the froth to be moved to one bank by water current.
11. A method of utilization of the froth collectors as it is claimed in Claim 9, wherein the said froth is moved or pumped from said collectors to froth collection tanks, ponds or treatment plant.
12. A construction of froth collectors as it is claimed in claim 8 and claim 9, which enables:
  - the said froth collector either to float on the top of the water or to be supported on the top of the water and the said froth collector to protrude from one bank of the said water stream to another bank maintaining the designed shape and form of the said froth collector,
  - the removal of froth from either all length of the said froth collector or from selected points of the said froth collector, for example, but not limited by this example, the said froth collectors are constructed from hollow water logs wrapped in polyethylene film, the said water logs are tied together and float on the top the water, and froth sucking pipe is supported by the said water logs.
13. A method of flotational clean up of spills into running water wherein flotational agents are added to the said contaminated spots of the water and flotational traps are installed downstream to intercept the contamination, the said flotational traps means the said air curtain and froth collectors are both installed downstream.